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MEMORANDUM OF INFORMATION ON INSECTICIDES USED AGAINST LYGUS BUGS ON SUGAR BEETS GROWN FOR SEED

By Orin A. Hills
Division of Truck Crop and Garden Insect Investigations

This memorandum summarizes briefly the results of experiments conducted during the 1944 season for the control of Lygus bugs on sugar beets grown for seed. Several new insecticides were tested on small plots of seed beets and some produced results as good as or better than the pyrethrum extract-sulfur dust previously recommended for the control of Lygus on this crop. The effect of the Lygus control program on the yield and viability of large and small seed balls has also been further determined, and the purpose of this memorandum is to make the results of these experiments available to those interested in the production of sugar beet seed.

During the 1944 season seven insecticides, five of which had not been previously tested in the field on seed beets, were tested in experimental plots. Eight replicate plots, each 24 by 32 feet (approximately 1/58 acre) were used in each case and the following insecticides were tested: (1) DDT 4.5 percent, pyrophyllite 95.5 percent; (2) a pyrethrum extract dust and sulfur mixture containing 0.20 percent of pyrethrins and 50 percent of sulfur. (This material has given good results in the past and was included in this experiment for comparison with the other insecticides); (3) a dust containing 3.25 percent of beta, beta-dithiocyanodiethyl ether, 75 percent of sulfur, and 21.75 percent of inert ingredients; (4) dinitro-o-cresol 1 percent, sulfur 99 percent; (5) dusting sulfur (325-mesh); (6) a dust containing 20 percent of dry lime-sulfur and 80 percent of dusting sulfur; (7) a dust containing 57 percent of sulfur, 5 percent of petroleum oil, and 38 percent of talc. The first application was made on May 11, at which time the beets were in the full-bloom stage, and the second application was made 8 days later. Insect-population samples showed that the one application of DDT had reduced Lygus numbers to a very low level and that they remained so until harvest; a second application was therefore unnecessary. The dinitro-o-cresol caused severe burning of the plants and one application was sufficient to show that this material was not safe for use on seed beets.

The seed from a sample area four rows wide and 10 feet long in the center of each plot were harvested, threshed, and cleaned, and a sample taken from each for germination analysis. A No. 7 "Clipper Mill" and a canvas belt draper were used in the cleaning operation, the seed being run first through the mill and then over the draper. In milling, as little air as possible was used to separate the trash

from the seed, and thus practically all seed were saved. The seed were cleaned over a 7/64-by 3/4-inch screen and then separated into "large" and "small" seed by passing them over an 8/64- by 3/4-inch screen. By this method all seed balls retained by an 8/64- by 3/4-inch screen were termed "large seed" while those seed balls passing through the 8/64- by 3/4-inch screen but retained by the 7/64- by 3/4-inch screen were termed "small seed." Thus the "large seed" referred to in this memorandum are seed balls over 8/64 inch in diameter and the "small seed" are those seed balls between 7/64 and 8/64 inch in diameter. Yield data and results of germination analyses for large, small, and total seed from the variously treated plots are given in table 1. The analyses of the data in this table showed that there were no significant increases in yield of large seed due to treatment although there is a tendency toward an increase in the yield of large seed for those plots treated with DDT. The increase in the yield of small seed was, however, shown to be mathematically significant for the DDT-treated plots. A definite decrease in yield of large seed is indicated for the plots treated with dinitro-o-cresol, but this decrease is not significant for the small seed.

Results of germination tests in the accompanying table show that one application of DDT gave results as good as or better than two applications of the pyrethrum extract-sulfur dust previously recommended for the control of Lygus in seed beets. A few large-scale experiments in field control were conducted with DDT and similar results were obtained. The plots treated with beta, beta'-dithiocyanodiethyl ether yielded seed of somewhat better quality than those treated with dusting sulfur, but there was a tendency toward a decrease in the seed yield from these plots, and further tests are necessary before it can be recommended. The quality of the seed produced on those plots treated with the oil-sulfur and those treated with the mixture of lime-sulfur and sulfur was improved over that from the untreated plots, but these materials were shown to be no better than dusting sulfur alone.

Yield data in the table show that approximately 13 percent of the total yield were small seed which would ordinarily be lost by the use of an 8/64- by 3/4-inch screen. It is generally understood that the percent of germinating seed is lower in the case of the small seed. Past years' data as well as the data in the table substantiate this theory. However, these data also show that where Lygus bugs were controlled the viability of these small seed was improved to an even greater degree than was the viability of the large seed.

Investigations to date indicate that DDT is a very good insecticide against Lygus on seed beets. Extensive field trials, however, have not as yet been made. Experiments of the past season have shown that DDT is very toxic to beneficial insects such as ladybeetles, lacewings, and parasites which occur in the beet fields and which are responsible for holding aphid infestations in check. The action of DDT against aphids is uncertain and therefore the elimination of the insect parasites and predators from the beet fields may create a condition which would result in the rapid buildup of destructive populations of aphids.

Table 1.--Yield and viability of seed from small plots of seed beets treated experimentally for Lygus control (8 replicate plots arranged in Latin square). Phoenix, Ariz., 1944

Treatment	Number of applications	Seed yield					Seed viability		
		Pounds per acre			Percent		Percent of germinating seed		
		Large[1]	Small[2]	Total	Large	Small	Large	Small	Total
(1) DDT	1	3,486	542	4,028	86.5	13.5	93.0	79.2	91.2
(2) Pyrethrum extract dust plus sulfur	2	3,073	454	3,527	87.2	12.8	90.6	75.4	88.6
(3) Beta,beta'-dithiocyanodiethyl ether plus sulfur	2	2,994	459	3,453	86.7	13.3	86.4	70.0	84.2
(4) Dinitro-o-cresol	1	2,344	365	2,709	86.6	13.4	84.6	59.0	81.1
(5) Sulfur	2	3,062	475	3,537	86.6	13.4	82.9	55.4	79.1
(6) Lime-sulfur plus sulfur	2	3,106	443	3,549	87.5	12.5	82.7	54.7	79.2
(7) Oil plus sulfur	2	3,285	463	3,748	87.6	12.4	82.5	54.8	79.1
(8) Untreated check	0	3,218	405	3,623	88.8	11.2	73.1	39.2	64.9

[1] 8/64 inch and over.

[2] 7/64 to 8/64 inch.

DDT now being manufactured is devoted to military uses and only a comparatively small supply is available for experimental use in agriculture. If sufficient DDT becomes available, large-scale commercial field tests are planned for the season of 1945 so that the usefulness of DDT as a control for Lygus may be properly evaluated and its effect on other insects occurring in the seed beet fields may be further determined.